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INVENTOR(S)

| | | |
|--|------------------------|---|
| Given Name (first and middle (if any)) | Family Name or Surname | Residence (City and either State or Foreign Country) |
| Wayne Ernest | Conrad | Hampton, Ontario, Canada |

☐ Additional inventors are being named on the _____ separately numbered sheets attached hereto

TITLE OF THE INVENTION (280 characters max)

CORRESPONDENCE ADDRESS

Direct all correspondence to:

☒ Customer Number

1059

Place Customer Number
Bar Code Label here

OR

Type Customer Number here

☒ Firm or
Individual Name

Philip C. Mendes da Costa

Address

Address

City

State

ZIP

Country

Telephone

Fax

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☐ Other (specify)☒ Application Data Sheet. See 37 CFR 1.76**METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT**☒ Applicant claims small entity status. See 37 CFR 1.27.☐ A check or money order is enclosed to cover the filing fees☒ The Commissioner is hereby authorized to charge filing
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AMOUNT (\$)☐ Payment by credit card. Form PTO-2038 is attached.The invention was made by an agency of the United States Government or under a contract with an agency of
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SIGNATURE

Date

October 1, 2002

TYPED or PRINTED NAME

Philip C. Mendes da Costa

REGISTRATION NO.
(if appropriate)

33,106

TELEPHONE

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USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

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Applicant Information

Inventor Authority Type:: Inventor

Primary Citizenship

Country:: Canada

Status:: Full Capacity

Given Name:: Wayne

Middle Name:: Ernest

Family Name:: Conrad

Name Suffix:: Mr. No more than 10 characters

City of Residence:: Hampton

State or Prov. Of

Residence:: Ontario

Country of Residence:: Canada

Street of mailing address:: 9 King Street

City of mailing address:: Hampton

State or Province of

mailing address:: Ontario

Country of mailing address:: Canada

Oct-01-02

16:27

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Info@bereskinparr.com T-069 P-006/067 F-098

Postal or Zip Code of
mailing address::

LOB 1J0

NOTE: REPEAT THIS INFORMATION FOR EACH INVENTOR OR OTHER
APPLICANT.

Correspondence Information

Correspondence Customer

Number:: 001059

Phone Number:: 416-957-1695

(Max. 3 telephone numbers)

Fax Number:: (416) 361-1398

E-Mail Address:: pmdcosta@bereskinparr.com

(Max. 3 e-mail addresses)

Representative Information

Representative

Customer Number:: 001059

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info@bereskinparr.co t-069 P.007/067 F-098

Assignee Information

Assignee name::

Street of mailing address::

City of mailing address::

State or Province of

mailing address::

Country of mailing address::

Postal or Zip Code of

mailing address::

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UNITED STATES

Title: Portable Personal Watercraft
Inventor: Wayne Ernest Conrad

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Title: Portable Personal Watercraft**FIELD OF THE INVENTION**

5 [0001] This invention relates generally to marine craft and more particularly to an extremely lightweight, easily transportable highly maneuverable personal watercraft for recreational and other boating purposes.

BACKGROUND OF THE INVENTION

10 [0002] Recreational boating has become very popular, not only in the United States, but throughout the world. Most small size personal watercraft are of a size and weight requiring a trailer to transport them to and from the launch site. Depending upon an individual's lifestyle and living accommodations, the use of a trailer may be precluded. For example,
15 apartment dwellers in many locations do not have the space available to them for storing a boat and trailer when not in use.

[0003] Other types of recreational boats include the canoe. While a canoe may be transported atop the roof of an automobile, such a watercraft must be paddled, although it is also possible to power a canoe with an
20 outboard motor of some type. A further drawback of the canoe is that it is relatively slow and unmaneuverable and may be somewhat prone to tipping.

SUMMARY OF THE INVENTION

25 [0004] In accordance with the instant invention, an improved personal watercraft for recreational and utilitarian purposes is provided. The watercraft may have one or more of the following features and advantages.

[0005] In accordance with one embodiment of this invention a personal watercraft is constructed to enable it to be readily collapsed. The collapsed watercraft may then be manually carried and easily transported in the trunk of
30 an automobile and without the need for a trailer. Preferably, the watercraft has one or more inflatable sections to permit it to be collapsed.

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[0006] In accordance with another embodiment of this invention a pump is provided to inflate and/or deflate the inflatable sections of the craft. Preferably, the pump is provided as part of the watercraft. More preferably, the pump is in air flow communication with the inflatable sections such that at
5 the press of a button it may be actuated to inflate and/or deflate the watercraft thereby making the packing and unpacking of the craft simple, convenient, and quick.

[0007] In accordance with another embodiment of this invention the watercraft has a central rigid core in which the battery is stored. Alternately, or
10 in addition, the deflated craft can quickly be folded for storage in the rigid core. This rigid core may also incorporate wheels that are exposed when the craft is deflated or which are inflated when the craft is deflated to facilitate transportation to and from the waterfront. Alternately, or in addition, the motor and propeller or impeller unit can also be translated vertically into this rigid
15 section for driving the unit to shore and for storage and transportation.

[0008] In accordance with another embodiment of this invention a means to mechanically and electrically connect an electrically actuated or manually actuated anchor to the central rigid core is provided.

[0009] In accordance with another embodiment of this invention a
20 seating area comprised of one or more, and preferably several, layers of inflatable material (e.g. air impermeable fabric, plastic, rubber or the like) are provided to allow the seating position to be raised or effectively moved forward to allow smaller riders complete access to the controls.

[0010] In accordance with another embodiment of this invention
25 armrests are provided. The armrests can be optionally inflated to provide more comfortable seating.

[0011] In accordance with another embodiment of this invention telescoping handles and handles that can bend 90 degrees to accommodate the comfort of different riders are provided for steering the watercraft.

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[0012] In accordance with another embodiment of this invention a marine craft that is small in size, light in weight, very stable in water and extremely maneuverable uses a single centrally located steering control mechanism. Preferably, the steering control mechanism incorporates a trim control. Alternately, or in addition, the steering control mechanism incorporates a mechanically linked rudder which augments the turning forces produced by the rotation of the motor and propeller or impeller unit thereby allowing a small motion in the steering to create a significant change in direction. This augmented rudder allows steering of the craft at very low thrust levels.

[0013] In accordance with another embodiment of this invention the drive system for this marine craft comprises a safety cage that is constructed to reduce the chance for damage to the propeller or impeller due to contact with rocks or the lake bottom and reduces the danger for swimmers or wildlife which might otherwise come into contact with the propeller or impeller. The safety cage may comprise an open web about the impeller or propeller. Alternately, it may comprise a solid section with an inlet and an outlet wherein the inlet and outlet are constructed to prevent a person from reaching inside (such as by providing a mesh cover to the inlet and the outlet or by sizing the inlet and outlet to prevent a person from reaching inside).

[0014] In accordance with another embodiment of this invention the water hull that is in contact with the water is configured to minimize the surface area and hence the drag to the system and maximize the available speed by providing a long contact line between the water while a secondary hull above provides the room necessary for the comfort and safety of the rider and any accessories the rider may desire.

[0015] In accordance with another embodiment of this invention the water hull comprises one, two or more water hulls having a narrow width, a long length, and a gentle lead in as a classic kayak wherein the water hull is an inflatable member or is an inflatable core with a durable outer surface,

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such as hard plastic or fiberglass, affixed thereto or formed integrally therewith or coated thereon in contact with the water.

5 [0016] In accordance with another embodiment of this invention the water hull comprises one, two or more water hulls having a narrow width, a long length, and a gentle lead in as a classic kayak but which are narrower than a classic kayak as the riders body is supported above the water hull wherein the water hull is constructed to receive the riders feet and some auxiliary equipment such as batteries therein

10 [0017] In accordance with another embodiment of this invention rigid members such as carbon or aluminum rods or tubes are provided to stiffen the inflatable sections or to more rigidly mechanically link (i.e. dimensionally stabilize) various plastic hull sections with other plastic hull sections.

15 [0018] In accordance with another embodiment of this invention a plurality of motors and propellers or impellers that are in parallel flow or in flow communication with each other are provided so that the power required from each individual motor is reduced.

20 [0019] In accordance with another embodiment of this invention the water flow from two or more propellers each driven by an individual motor are in flow communication with each other so as to reduce the vortex losses in the fluid system thereby increasing the energy transfer efficiency between the electric motors and the water while protecting users from touching said propellers.

25 [0020] In accordance with another embodiment of this invention flow straighteners are provided at the outlet to reduce or effectively eliminate vortices induced by the impellers or propellers. The flow straighteners also serve to protect the user from accidental contact with the impellers or propellers.

30 [0021] In accordance with another embodiment of this invention the watercraft comprises multiple individual inflation chambers that define a primary hull and a secondary hull. The secondary hull is designed to provide

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sufficient buoyancy to prevent the watercraft from sinking if the primary hull is damaged. In many jurisdictions, riders are required to wear personal flotation devices. Therefore, if the secondary hull produces neutral buoyancy for the watercraft, the watercraft will only be submerged to a level at which the rider
5 is supported by the personal flotation device if the primary hull is damaged to the point at which it provides no flotation. It will be appreciated that the secondary hull may optionally provide more than neutral buoyancy in such cases. Preferably, the secondary hull is mounted above the primary hull. Alternately, or in addition, the secondary hull comprises a plurality of
10 chambers, preferably, outer, intermediate and inner chambers, such that damage to the outer chambers will still allow the craft to float with the rider. In the event that all chambers are compromised the craft will float

[0022] In accordance with another embodiment of this invention a cartridge filled with an expanding foam product such as polyurethane is
15 provided. The cartridge may be engaged in an emergency to inflate some or all of the inflation chambers even if they are compromised and could no longer be filled with air so as to provide a displacement hull to keep the watercraft afloat. Alternately, the cartridge may be engaged upon delivery of the product to the site where it is to remain so as to inflate some or all of the
20 inflation chambers with a foam that will provide a displacement hull to keep the watercraft afloat even if the inflatable chambers become compromised by puncturing.

[0023] In accordance with another embodiment of this invention an inner rigid chamber is provided one or more of the battery is housed, the
25 motor unit or units are affixed, the optional manual or electric anchor is affixed, and/or which incorporates structural foam elements which allow the craft to float even if all its inflatable chambers have been compromised.

[0024] In accordance with another embodiment of this invention an emergency inflation section, which is not normally inflated, is provided and is
30 preferably protected from damage by a rigid (e.g. hard plastic) cover. The

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emergency inflation section is inflated in case of an emergency by means of a pressurized has cylinder.

5 [0025] In accordance with another embodiment of this invention the watercraft incorporates a small water cannon and/or electronics to allow scoring when a water jet hits a sensor on the watercraft to facilitate various games or tag and warfare simulation. Preferably, means of controlling the firing and the scoring of the watercraft water cannon games is provided.

[0026] In accordance with another embodiment of this invention a position for the mounting of fishing pole holders is provided.

10 [0027] In accordance with another embodiment of this invention the watercraft includes a position for a live well to allow fish caught to be kept alive by having water circulate in the holding tank with an auxiliary pump or automatically when the main motor of the craft is engaged.

15 [0028] In accordance with another embodiment of this invention the watercraft comprises an inflatable hull vessel that can be powered by an electric motor, an internal combustion engine, a Stirling engine, or a steam engine used to drive a propeller or impeller.

20 [0029] In accordance with another embodiment of this invention the watercraft includes a series of super bright LEDs to provide illumination for visibility in the day or at night with minimum power expenditure.

[0030] In accordance with another embodiment of this invention the watercraft includes a means of affixing a sun shield that may optionally incorporate solar panels to charge the battery or batteries of the unit.

25 [0031] In accordance with another embodiment of this invention the watercraft includes a means of mechanically and electrically connecting a fish finder and a means of mounting the associated transducer.

30 [0032] In accordance with another embodiment of this invention the watercraft includes an inflatable boat having a battery or an engine module which may be easily coupled and uncoupled from the boat so that the two may be separately carried to and from the launch site but which can then be

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readily joined. The inflatable watercraft comprises an inflatable hull and may incorporate optional rigid hull sections having in its plan view one or more water hulls which are generally long and gently tapered outward along half to two thirds of the length which is transversely semi circular and curves
5 upwardly toward a point at the bow. Fastened to the upper surface of the hull member are tubular inflatable members which are generally circular in cross section and which are shaped so that when joined end-to-end conform to the periphery of the water hull.

[0033] The central rigid member may be either in a mono hull, joins a
10 catamaran design, or is in the center hull of a trimaran and provides the means of inflating and deflating the craft, stowing the craft by folding the deflated members in a prescribed manner, and houses the motor, battery and steering module and optionally provides a place for rigid or inflatable wheels to be affixed to aid transportation. The power module typically comprises a
15 battery or series of batteries and one or more electric motor but may comprise an internal combustion engine, a Stirling engine, or a steam engine whose output shaft directly drives the propeller of impeller in the drive pod located below the boat during normal operation. When the power module comprises an internal combustion engine, a Stirling engine, or a steam engine, the
20 exhaust gasses preferably pass through an exhaust immersed in the water to provide low temperature exhaust gasses thereby improving user safety.

[0034] In accordance with another embodiment of this invention the steering control column preferably also provides speed control, stopping, forward and reverse as well as trim controls if installed.

25 [0035] By providing a relatively lightweight power module readily separable from the lightweight, rigid hull, inflatable watercraft, an adult, with relative ease, can deflate the watercraft and lift the watercraft into the trunk of a car or van and place the power module separately in the trunk for transportation.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0036] The foregoing features and advantages of the invention will become more apparent to those skilled in the art from the following detailed description of a preferred embodiment, especially when considered in conjunction with the accompanying drawings in which like numerals in the several views refer to corresponding parts. It will also be recognized by those skilled in the art that various embodiment features may be recombined to produce a watercraft optimized to specialized applications such as fishing, hunting, general recreation, touring, etc.

10 **[0037]** Figure 1a is a left side perspective view of the watercraft made in accordance with one embodiment of the present invention.

[0038] Figure 1b is a front view of the watercraft of Figure 1a.

[0039] Figure 2a is a front view of another embodiment of the watercraft made in accordance with the present invention.

15 **[0040]** Figure 2b is a side view of the watercraft of Figure 2a.

[0041] Figure 2c is a top view of the watercraft of Figure 2a.

[0042] Figure 3 is a left side perspective view of another embodiment of the watercraft made in accordance the present invention incorporating a solar charging system, a retractable sun shade, a live well, bait storage area, and small food and drinks cooler.

[0043] Figure 4 is a rear view of the steering module of an embodiment of the watercraft incorporating many advanced features.

[0044] Figure 5a is a perspective view of another embodiment of the watercraft made in accordance with the present invention.

25 **[0045]** Figure 5b is a perspective view of another embodiment of the
watercraft made in accordance with the present invention.

[0046] Figure 5c is a perspective view of another embodiment of the watercraft made in accordance with the present invention.

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- [0047]** Figure 6a is a perspective view of another embodiment of the watercraft made in accordance with the present invention.
- [0048]** Figure 6b is a perspective view of another embodiment of the watercraft made in accordance with the present invention.
- 5 **[0049]** Figure 6c is a perspective view of another embodiment of the watercraft made in accordance with the present invention.
- [0050]** Figure 7 is a perspective view of another embodiment of the watercraft made in accordance with the present invention wherein an inflatable hull is affixed to sections of rigid hull.
- 10 **[0051]** Figure 8 is a perspective view of another embodiment of the watercraft made in accordance with the present invention wherein an inflatable hull is affixed to sections of rigid hull and carbon fiber or aluminium rods also mechanically link the rigid members.
- [0052]** Figure 9 is a perspective view of another embodiment of the watercraft made in accordance with the present invention wherein two
15 batteries are contained within the hull.
- [0053]** Figure 10a is a perspective view of a motor and propeller module.
- [0054]** Figure 10b is a side view of a motor and propeller module.
- 20 **[0055]** Figure 10c is a front view of a motor and propeller module.
- [0056]** Figure 11a is a perspective view of a twin motor and twin propeller module with a single mounting shaft.
- [0057]** Figure 11b is a front view of a twin motor and twin propeller module with a single mounting shaft.
- 25 **[0058]** Figure 12a is a perspective view of a triple motor and triple propeller module with a single mounting shaft.
- [0059]** Figure 12b is a front view of a triple motor and triple propeller module with a single mounting shaft.

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- [0060] Figure 13a is a perspective view of a twin motor and twin propeller module with two mounting shafts controlled in parallel.
- [0061] Figure 13b is a top view of the control linkage of figure 13a.
- [0062] Figure 13c is a front view of a twin motor and twin propeller
5 module with two mounting shafts controlled in parallel.
- [0063] Figure 14a is a perspective view of a twin motor and twin propeller series module with a single mounting shaft.
- [0064] Figure 14b is a side view of a twin motor and twin propeller series module with a single mounting shaft.
- 10 [0065] Figure 15a is a perspective view of a triple motor and triple propeller series module with a single mounting shaft.
- [0066] Figure 15a is a side view of a triple motor and triple propeller series module with a single mounting shaft.
- [0067] Figure 16a is a side view of a single motor and single propeller
15 module with a single mounting shaft and an intake trim unit in the up position.
- [0068] Figure 16b is a side view of a single motor and single propeller module with a single mounting shaft and an intake trim unit in the neutral position.
- [0069] Figure 16c is a side view of a single motor and single propeller
20 module with a single mounting shaft and an intake trim unit in the down position.
- [0070] Figure 17a is a side view of a single motor and single propeller module with a single mounting shaft and an outlet trim unit in the up position.
- [0071] Figure 17b is a side view of a single motor and single propeller
25 module with a single mounting shaft and an outlet trim unit in the neutral position.

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[0072] Figure 17c is a side view of a single motor and single propeller module with a single mounting shaft and an outlet trim unit in the down position.

5 [0073] Figure 18a is a side view of a single motor and single propeller module with a single mounting shaft and an inlet and an outlet trim unit in the up position.

[0074] Figure 18b is a side view of a single motor and single propeller module with a single mounting shaft and an inlet and an outlet trim unit in the neutral position.

10 [0075] Figure 18c is a side view of a single motor and single propeller module with a single mounting shaft and an inlet and an outlet trim unit in the down position.

[0076] Figure 19 shows the accelerated rudder control system.

15 [0077] Figure 20 (a) - (c) shows the motor being pulled up into the position to drive the watercraft to shore.

[0078] Figure 21 is a perspective view that illustrates a means of assembling the electric motors and propeller sections of the watercraft.

20 [0079] Figures 22(a) - (d) show the inflation and deflation steps for the watercraft in accordance with one embodiment of this invention of this invention.

DETAILED DESCRIPTION OF THE INVENTION

25 [0080] An embodiment of the watercraft that is the subject of the instant invention is shown in a perspective view in Figure 1a. In this embodiment, the watercraft includes a number of subassemblies, namely, the inflatable boat 1, a drive system 2, a battery 3, a seat assembly 4 and the steering and thrust control 5. The boat portion 1 includes a rigid hull member 6, which is preferably molded from fiberglass or other suitable plastic material, and may typically be approximately two millimeters thick. It is found that a slope angle

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of about 10 to 25 degrees with the horizontal expanding towards a point two-thirds towards the stern similar to the design of a kayak for the rigid hull provides excellent stability and minimized flow resistance characteristics.

[0081] As best seen in the front view Figure 1b view, the rigid hull member 6 is generally a circular arc thereby minimizing the flow resistance in the water. The water line is preferably below where the rigid portion of the hull ends so that the inflatable hull 8 does not typically contact the water 7, thus reducing the water resistance. However, it will be appreciated by one skilled in the art that in another embodiment, the design of a more stable craft for children where less speed is required would have the air-filled tubes 9 in contact with the water to provide additional buoyancy and stability.

[0082] The inflatable hull 8 preferably consists of a number of independent chambers, such as chambers 9, 10, 11, 12, 13 and 14 is typically bonded to the upper surface of the rigid hull 6 and to the central rigid core 15. These chamber 9, 10, 11, 12, 13 and 14 may be made from a multiple layers of air impermeable material such as air impermeable fabric which may include such synthetic fibers as nylon or other polyesters and laminated with rubberized material, such as NEOPRENE®, which exhibits superior air retention. The rigid hull may comprise polyester. Externally, the polyester core is preferably coated with one or more and preferably two additional layers of NEOPRENE® which provides strength and flexibility. A durable exterior coating of, e.g., HYPALON® or KELVAR® is then preferably used on the outer layer to provide abrasion resistance and ultraviolet ray protection against the combined effects of water and sun.

[0083] As seen in Figure 1b, rather than using one continuous air chamber, it has been proven expedient to construct the inflatable hull 8 from a plurality of contiguous inflatable chambers 9, 10, 11, 12, 13 and 14 in that, should one or two such chambers accidentally be punctured in use, the entire inflatable hull 8 would not become deflated. As seen in Figure 1b, the tubular segments 11 and 12 are of a larger diameter than the tubular segments 9, 10, 13 and 14, which are bonded to the rigid central support.

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[0084] The rigid hull member 6 is preferably in the shape of a circular arc thereby minimizing the flow resistance in the water.

[0085] The drive system 2 of the embodiment of Figures 1(a) and (b) comprises an electric motor 16, a tubular duct 17, a propeller 18, an intake guard 20 and an outlet flow straightener and protective guard 19.

[0086] The seat assembly 4 of Figure 1(a) comprises at least one and preferably a series of inflatable chambers (e.g. chambers 21, 22, 23 24, and 25) which can be optionally selectively inflated so as to position the rider for optimal comfort and in a position where they can effectively manipulate the steering and thrust control unit 5.

[0087] The steering and thrust control assembly 5 of Figures 1(a) comprises includes two handles for steering 26 and 27 into which a starboard and port super bright LED 28 and 29 are preferably incorporated.

[0088] The rotation of the handle 27 preferably controls a pulse width modulation circuit or engages several motor windings to control the speed and direction of the craft. Preferably, clockwise rotation increases the forward speed from the neutral position while counter clockwise rotation from the neutral position preferably increases the backward or reverse speed of the craft. The direction of rotation of the thrust control from the neutral position controls the direction and speed of rotation of the electric motor 16 to whose output shaft the propeller 18 is mechanically affixed.

[0089] A series of super bright LEDs 30, 31, and 32 are preferably provided to illuminate the area in the direction in which the craft is being steered. The super bright LEDs 33, 34, and 35 are preferably provided to illuminate the direction in which the hull is traveling. A super bright LED 36 is preferably provided to be visible from the rear of the vessel, such as at the top of the seat assembly 4.

[0090] A pair of carry handles 40 and 41 are preferably provided for manually moving the watercraft and may be attached to the central rigid core 15 but may optionally be affixed to the inflatable hull 8 of the vessel.

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[0091] A pair of water cannons 37 and 38 may be provided as a game. They may be mounted on the inflatable hull 8 or onto the central rigid core 15.

[0092] The steering and thrust control assembly is electrically connected to the battery 3 and the drive system 2 and is rotatably mounted to the central rigid core 15 such as by means of a shaft 39 which extends between the steering and thrust control unit 5 and the drive system 2.

[0093] A hard point 42 may be mechanically affixed to the central rigid core 15 thereby providing a means of affixing a manual anchor or a towline.

[0094] In accordance with the foregoing, the resulting watercraft may have a body weighing only about 30 pounds and an engine module weighing 25 pounds and a battery weighing approximately 20 pounds. Because the three are readily separable and joinable, they can be carried as separate units. Moreover, the body portion may be readily placed atop an automobile or van. Because of the material from which the inflatable tubes are made, when placed on a car roof tube-side-down, there is no concern that the finish on the car will be damaged. The length and width of the boat portion can be designed so that it may readily be carried on the swim platform of a cruiser and usable as an auxiliary watercraft for running errands and the like when the larger craft is beached for extended periods.

[0095] Another embodiment of the watercraft, which is the subject of the instant invention, is shown in a frontal view in Figure 2a and in a side view in Figure 2b, and a top view in Figure 2c. The watercraft in Figure 2a, 2b and 2c includes a number of subassemblies, namely, the inflatable deck 43, a water hull 44, a heat engine 45 coupled to a propeller drive system 46, an auxiliary battery 47, a seat assembly 48 and the steering and thrust control 49. The inflatable deck 43 is attached to the water hull 44. The inflatable deck 43 comprises a plurality of chambers (e.g. chambers 50, 51, 52 and 53) that are affixed by any means known in the art (e.g. mechanical fasteners, integral manufacturing or adhesion such as bonding) to the central rigid core 54. The water hull 44 is generally a circular arc thereby minimizing the flow resistance in the water. The water line is typically below where the water hull attaches to

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the inflatable deck. Thus, by having a hydrodynamically sound water hull 44 the shape of the inflatable hull 43 can be made to look like a spacecraft or a boat or a fictional character which might otherwise be hydrodynamically inefficient or even unsound for use as a boat.

- 5 [0096] Two water cannons 55 and 56 may be mounted on the inflatable deck and may be in flow communication with an electric pump which is switched on and off by switches on the steering and thrust control unit 49.

- [0097] The drive system for this watercraft may comprise a heat engine 45 that is connected to a linear to rotary mechanisms 57 onto whose
10 output shaft the propeller 58 is attached. It will be appreciated that a convention motor may be used.

- [0098] The seat 48 and the LED lighting and controls may be similar to the watercraft shown in Figure 1a and 1b and are not shown in Figures 2a and 2b for simplicity.

- 15 [0099] The rotation of the handle 27 in this design controls the fuel flow rate to the heat engine thereby controlling the speed of the propeller and hence the speed of the craft. Typically, clockwise rotation increases the forward speed from the neutral position. A reversing gear engaged by a lever may optionally be installed but is not shown.

- 20 [00100] A windscreen 59 is optionally provided for the comfort and safety of the rider and to allow a "water" sensor 60 or plurality of sensors (not shown) to be mounted as part of a system to detect a water spray impact by a water cannon of another craft as part of a game described later.

- [00101] A canister of pressurized polyurethane foam 61 and a means to
25 activate it 62 are optionally provided such that the foam canister is connectable in flow communication with chambers 51 and 52 such that chambers 51 and 52 (and optionally other chambers) can be filled by foam either upon delivery of the craft to the customer if a reduction in portability is acceptable or in the case of an emergency where one or more of the

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chambers of the inflatable hull or water hull become punctured and floatation of the vessel is inhibited.

5 [00102] Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view in Figure 3. The mechanical and steering arrangement of this craft is similar to the craft in Figure 1a and 1b. This embodiment incorporates a solar panel array 63 that is electrically connected to the battery of the vessel that powers the electric motor by means of wires and switches not shown. A retractable sun umbrella 66 is also optionally provided.

10 [00103] A pair of inflatable armrests 67 and 68, which may be comprised of a series of internal chambers (not shown), may optionally be included for the comfort of the rider.

[00104] A fishing pole holder may optionally be provided.

15 [00105] A means of mounting a fish finder 70 to the steering column 71 is also optionally provided and the means of electrically connecting said fish finder to the battery by means of wires and switches (not shown) is also optionally provided.

20 [00106] A live well 72 that is constantly filled with fresh water from a flow diverted from the pressure side of the propulsion system by means of the hose 73 may optionally be provided. Alternately, a separately controlled electric pump can fulfill this purpose. A small electrically driven air pump 74 may be provided to provide oxygen rich air to tube 75 and force said air through sparger 76 to maintain an oxygen level in the live well 72 sufficient for the fish caught to remain alive.

25 [00107] A small cooler 77, which may be kept cool by means of ice or by means of a refrigeration system such as a peltier effect thermoelectric module is optionally also provided and is powered by the battery 64.

30 [00108] A small generator 70 is also optionally provided to recharge the batteries by wires (not shown) at a rate that is insufficient to drive the propulsion system constantly at full speed. The use of a small generator is

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made practical by the fact that when fishing or trolling at slow speeds, the small generator provides a net charge to the battery whereas during the trip to and from the fishing locations at high speed, the energy stored in that battery provides the additional energy required by the [propulsion system but which
5 cannot be supplied by the small generator.

[00109] A small compartment 78 for keeping bait, tackle, and other materials including an emergency kit is also optionally provided.

[00110] A preferred layout for the controls of the embodiment of the
10 watercraft shown in Figure 1a and 1b, which is the subject of the instant invention, is shown in Figure 4. A series of switches are provided. Switch 80 turns on and off the running lights 28, 29, 34 and 36 if this is installed in the craft. Switch 81 turns on and off the headlights 30, 31, 32, 33 and 35 if this is installed in the craft. Switch 82 fills or empties the live well 72 if this is
15 installed in the craft. Switch 83 provides a means of raising and lowering the electric anchor if such a device is installed. Switch 84 inflates and deflates the lumbar support and the armrests if they are installed. Switch 85 turns on and off the stereo and controls its volume while switch 87 controls the radio and the CD player if this is installed in the craft. CDs are preferably loaded
20 into the waterproof holder 87 and the music is heard through one or more speakers (e.g. speakers 88 and 89). As other watercraft typically employ noisy motors, a radio system is not useable hence such systems were not previously incorporated. The display of the radio is 193. The brackets 90 and 91 provide the means for mounting optional equipment such as a fish finder
25 176 and a power outlet compatible with most fish finders is also optionally supplied. The fuses for the vessel may be accessible behind an access panel, e.g. access panel 92. Thus, the main wiring of the vessel is contained in a small area thereby minimizing connections and making maintenance and repair easier. As this position is high above the water line, the optimal
30 protection from water damage is provided.

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[00111] Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view Figure 5a. In this embodiment the battery 94 is positioned within an inflatable hull 93 as is the rigid central section 95 and the rider sits within the hull in the space 96. The construction, assembly, and control details of this embodiment are similar to the other embodiments described herein.

[00112] Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view Figure 5b. In this embodiment two batteries 97 and 98 are positioned in two separate inflatable hulls 99 and 100 and the rigid central section 101 joins these two hulls and the rider sits on the and the rigid central section 101 and keeps his legs within the hull in the spaces 102 and 103. The construction, assembly, and control details of this embodiment are similar to the other embodiments described herein.

[00113] Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view Figure 5c. In this embodiment three batteries 104, 105 and 106 are positioned in three separate inflatable hulls 107, 108 and 109 and two rigid central sections 110 and 111 join the respective hulls and the primary rider controlling the vessel sits within the hull in the space 113. Passengers may optionally occupy the hull spaces 112 and 114 or the riders may sit on rigid central sections 110 and 111. The construction, assembly, and control details of this embodiment are similar to the other embodiments described herein.

[00114] Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view Figure 6a. In this embodiment the battery 115 positioned within an inflatable water hull 116 and the rider sits on top of the inflatable hull 117 using seat 118 for comfort. The construction, assembly, and control details of this embodiment are similar to the other embodiments described herein.

[00115] Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view Figure 6b. In this

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embodiment two batteries 119 and 120 are positioned within two separate inflatable hulls 121 and 122 and a rigid central hull section 123 joins these two hulls 121 and 122 and the rider and the passenger sit on the rigid hull section 123 using seats 124 and 125 respectively. The construction, assembly, and control details of this embodiment are similar to the other embodiments described herein.

[00116] Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view Figure 6c. In this embodiment three batteries 126, 127 and 128 are positioned in three separate rigid hulls reinforced with inflatable members 129, 130, and 131 and two rigid central sections 132 and 133 join the respective hulls and the primary rider controlling the vessel sits on seat 134 while passengers may optionally occupy seats 135 and 136. The construction, assembly, and control details of this embodiment are similar to the other embodiments described herein.

[00117] Figure 7 illustrates one of the means of assembling the watercraft that is the subject of the instant invention. The inflatable hull 137 which may comprise chambers 138, 139 and 140 is affixed (e.g. bonded) to the upper surface of the rigid hull sections 141, 142, and 143 which are arranged such that the inflatable hull will form a flexible joint between the rigid hull sections 141, 142, and 143 when the inflatable hull 137 is deflated thereby facilitating the folding of the craft for storage.

[00118] Figure 8 illustrates another means of assembling the watercraft that is the subject of the instant invention. The inflatable hull 144 which may comprise chambers 145, 146 and 147 is affixed (e.g. bonded) to the upper surface of the rigid hull sections 148, 149, and 150 which are arranged such that rigid elements (e.g. carbon fiber or metal rods 151 and 152) can be inserted between the inflatable hull 144 and the rigid hull sections 148, 149, and 150 to form a more rigid hull to allow for higher speed operation. In this embodiment, once the carbon fiber or metal rods 151 and 152 are removed and the inflatable hull 144 is deflated, the inflatable hull 144

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will form a flexible joint between the rigid hull sections 148, 149, and 150 thereby facilitating the folding of the craft for storage.

[00119] Figure 9 illustrates another embodiment of the watercraft that is the subject of the instant invention wherein two batteries 153 and 154 are stored within the inflatable hull 155. The construction, assembly, and control details of this embodiment are similar to the other embodiments described herein.

[00120] Figures 10a and 10b are cutaways views and 10c is a front view that illustrates one of the means of assembling the electric motor and propeller section of the watercraft that is the subject of the instant invention. The electric motor 156 is connected to a gearbox 157 onto whose output shaft the propeller 158 is mounted. A duct 161 provides improved efficiency for the propeller 161 as do the flow straighteners 162 and 163 which also serve to protect the motor and propeller from damage by contact with rocks or the lake bottom as well as protecting swimmers and animals in the water from contact with the propeller. The entire assembly is rotated by shaft 160 thereby changing the direction of thrust hence changing the direction of the watercraft.

[00121] Figure 11a is a transparent view and 11b is a front view that illustrates another of the means of assembling the electric motor and propeller section of the watercraft that is the subject of the instant invention. The electric motors 231 and 164 are connected to gearboxes 165 and 166 onto whose output shafts the propellers 167 and 168 are mounted. Two ducts 169 and 170 provide improved efficiency for the propellers 167 and 168 as do the intake flow straighteners 172 and 173 and the outlet flow straighteners 174 and 175 which all serve to protect the motors and propellers from damage by contact with rocks or the lake bottom as well as protecting swimmers and animals in the water from contact with the propellers. The entire assembly is rotated by shaft 171 thereby changing the direction of thrust hence changing the direction of the watercraft. A significant advantage of employing two or more motors is that the current required to produce the desired power is reduced proportionally to the number of motors however, as resistive losses

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increase as the square of the current, this leads to a significant improvement in the run time available from a given battery for a given performance level.

[00122] Figure 12a is a transparent view and 12b is a front view that illustrates another of the means of assembling the electric motor and propeller section of the watercraft that is the subject of the instant invention. The electric motors 177, 178 and 179 are connected to gearboxes 180, 181 and 182 respectively onto whose output shafts the propellers 184, 185 and 186 are mounted. Three ducts 194, 195 and 196 provide improved efficiency for the propellers 184, 185 and 186 as do the intake flow straighteners 190, 191 and 192 and the outlet flow straighteners 187, 188, and 189 which all serve to protect the motors and propellers from damage by contact with rocks or the lake bottom as well as protecting swimmers and animals in the water from contact with the propellers. The entire assembly is rotated by shaft 183 thereby changing the direction of thrust hence changing the direction of the watercraft.

[00123] Figure 13a is a perspective view, Figure 13b is a top view, and Figure 13c is a front view that illustrates another of the means of assembling the directional controls for the electric motor and propeller sections of the watercraft that is the subject of the instant invention. The electric motor, gearbox and propeller assemblies 232 and 233 are each mounted on their own support shafts 197 and 198 to which gears 199 and 200 are mounted. The primary steering shaft 201 which is turned by the rider steering the watercraft is connected to gear 202 and the three gears 199, 200 and 202 are connected by the chain 203 such that the rotation of the steering shaft 201 by the rider causes the electric motor, gearbox and propeller assemblies 195 and 196 to rotate thereby steering the watercraft in the desired direction. It will be understood by anyone skilled in the art that this techniques may also be applied to two or motor motors.

[00124] Figure 14a is a transparent perspective view, and Figure 14b is a transparent side view that illustrates another of the means of assembling the electric motors and propeller sections of the watercraft that is the subject

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of the instant invention. In this embodiment, two electric motors 204 and 205 are mounted with their respective individual gearboxes 206 and 208 and respective individual propellers 207 and 209 are both mounted into a single tube 211 and share a common inlet flow straightener 212 and a common outlet flow straightener 213. The motors and propellers preferably counter rotate to improve their efficiency and optionally employ flow straighteners to further improve their efficiency and performance. A single steering shaft 210 is also employed. It will be recognized by anyone skilled in the art that that this techniques may also be applied to three or motor motors as shown in Figure 15a and Figure 15b.

[00125] Figure 16a, Figure 16b and Figure 16c are transparent side views demonstrating the concept of controlling the outlet angle to the motor, gearbox propeller assembly as a means of trimming the watercraft which is the subject of the instant invention. In each of the Figures, the electric motor is 214, the gearbox is 215, the propeller is 216, the outlet flow straightener is 220, the steering shaft is 217 and the tube 219. The trim of the vessel can be controlled by means of the rod 223, either dynamically with speed or fixed, by adjusting the angle of the outlet flow straighteners 218 which are pivotally mounted to the tube 219. The flow straighteners are shown in position to bring the bow of the watercraft upwards in Figure 16a, to keep the bow of the watercraft level in Figure 16b, and to bring the bow of the craft downwards in Figure 16c.

[00126] Figure 17a, Figure 17b and Figure 17c are transparent side views demonstrating the concept of controlling the angle of the intake flow straighteners 224 from the motor, gearbox propeller assembly as a means of trimming the watercraft which is the subject of the instant invention. The trim of the vessel can be controlled by means of the rod 225, either dynamically with speed or fixed, by adjusting the angle of the intake flow straighteners 224 which are pivotally mounted to the tube 226. The intake flow straighteners 224 are shown in position to bring the bow of the watercraft upwards in Figure

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17a, to keep the bow of the watercraft level in Figure 17b, and to bring the bow of the craft downwards in Figure 17c.

[00127] Figure 18a, Figure 18b and Figure 18c are transparent side views demonstrating the concept of controlling the angle of the inlet and outlet flow straighteners leading to and from the motor, gearbox propeller assembly as a means of trimming the watercraft which is the subject of the instant invention. The trim of the vessel can be controlled by means of rods 227 and 229, either dynamically with speed or fixed, by coordinating the adjusting of the angle of the pivotally mounted inlet flow straighteners 228 and the pivotally mounted outlet flow straighteners 230. The flow straighteners 228 and 230 are shown in position to bring the bow of the watercraft upwards in Figure 18a, to keep the bow of the watercraft level in Figure 18b, and to bring the bow of the craft downwards in Figure 18c.

[00128] Figure 19 is a transparent perspective view that illustrates another of the means of assembling the electric motors and propeller sections of the watercraft that is the subject of the instant invention. The electric motor 234 is connected to the gearbox 235 to whose output shaft the propeller 236 is attached. This assembly is centrally mounted within a tube 237 to which the inlet flow straightener 238 and the outlet flow straightener 239 and the steering shaft 240 are attached. The steering shaft 240 is pivotally mounted within a fixed housing 241 to which the gear 242 is fixedly mounted. A rudder 243 is pivotally mounted perpendicularly to the outlet flow straightener 239 by means of a shaft 244 to whose upper terminal end a gear 245 is fixedly attached. A chain 246 connects the gears 242 and 245. When the steering shaft is rotated it will be appreciated that the rudder will effectively rotate relative to the longitudinal axis of the tube 237 such that it will effectively multiply the effective angle through which the outflow from the propeller 236 is accelerated thereby allowing a small movement of the steering shaft 240 to create a larger turning effect. This allows a craft to be readily maneuvered with less motion of the steering mechanism. It will be appreciated by anyone skilled in the art that the gear and chain may be replaced with solid

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connecting rods, pulleys and cables or many other mechanical means known in the art.

[00129] Figures 20a, 20b and 20c are three transparent perspective views of a watercraft constructed as per an embodiment of the instant invention. In Figure 21a the motor, gearbox, propeller and steering assembly 247 is in the normal position for high speed operation of the craft wherein assembly 247 is disposed vertically below the plane of the water hull 248. In Figure 21b the motor, gearbox, propeller and steering assembly 247 is partially retracted into the hollow cavity 249 within the water hull 248 so as to allow operation in shallower waters. In Figure 21b the motor, gearbox, propeller and steering assembly 247 is fully retracted into the hollow cavity 249 within the water hull 248 so as to allow operation right onto the beach or landing area without damage to assembly 247. This illustrates the concept of vertically translating the electric motor, gearbox and propeller assembly 247 upwards into the hollow core of the watercraft water hull 248 or higher so as to allow easy beaching or landing of the craft and to facilitate deflation and subsequent transportation. It will be recognized by anyone skilled in the art that many mechanisms including levers, pulleys, gears, telescoping columns and other means may be employed to execute this embodiment of the instant invention.

[00130] Figure 21 is a transparent perspective view that illustrates another of the means of assembling the electric motors and propeller sections of the watercraft that is the subject of the instant invention. The electric motor 250 is connected to the gearbox 251 to whose output shaft the propeller 252 is attached. A propeller protective grill or safety cage 253 and 254 is mounted around the propeller 252 to prevent contact between the propeller and rocks or the lake bottom and to prevent contact between the propeller and swimmers or marine animals. Optionally, an inlet flow straightener 257 and an outlet flow straightener 256 may be added to the assembly to enhance performance

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[00131] Figures 22a, 22b, 22c and 22d are four transparent side views of a simplified version of the watercraft constructed as per the instant invention. In Figure 22a the motor, gearbox, propeller and steering assembly 247 is in the normal position for high speed operation of the craft wherein said assembly 247 is disposed vertically below the plane of the water hull 259.

[00132] In Figure 22b the motor, gearbox, propeller and steering assembly 247 is retracted into the rigid hollow cavity 260 within the water hull 259 so as to allow operation right onto the beach or landing area without damage to said assembly 258.

10 **[00133]** In Figure 22c the craft is now ashore and the watercraft water hull 259 and the seat 261 can now be deflated manually or by means of an electrical air pump which may be affixed permanently to the vessel and may also optionally inflate the vessel when unpacking it at the beach or launch area. When the craft is fully deflated, wheels 262 and 263 and their counterparts on the other side (not shown) which are rotatably affixed to the rigid hollow cavity 260 are exposed and can be used to help transport the watercraft. Preferably, wheels 262, 263 (and their unseen counterparts on the other side) are above the water line when the water hull 259 is inflated and the craft is operated in the water. Wheels 262 and 263 (and their counterparts on the other side) make transportation of the craft to and from the water easier. The battery 264 and/or the motor and steering assembly 258 may be removed at any point. Alternately, the battery 264 and/or the motor and steering assembly 258 may remain with the rigid hollow cavity 260 in which they are mounted.

25 **[00134]** The deflated water hull 259 and deflated seat 261 can then be folded onto and/or into the hollow rigid cavity 260 to facilitate transportation (see Figure 22d). The shaft of the motor, gearbox, propeller and steering assembly 247 may optionally be rotated to make the package smaller and to act as a carry or transportation handle.

30 **[00135]** The wheels 262 and 263 (and their unseen counterparts on the other side) may optionally be inflated to become conventional wheels or to

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become round balls to further facilitate easy movement on sandy beaches. Said wheels may either be manually inflated and deflated or may optionally be inflated and subsequently deflated by an electric pump permanently attached to the craft not shown.

- 5 [00136] Two additional optional handles 265 and 266 are preferably exposed when the watercraft is deflated but normally sit above the water line. These handles 265 and 266 allow easy transportation of the craft.

- [00137] It is to be understood that the invention can be carried out with many intercombinations of the various elements described herein and by
10 specifically different equipment and devices, and that various modifications, both as to the equipment details and operating procedures, can be accomplished without departing from the scope of the invention itself. In particular the use of the motor assembly maybe used with a convention hull, the inflatable hull of any of the configurations may be used with any
15 conventional motor design or any motor design discussed herein, The rigid hull may be used with any inflatable construction disclosed herein, and the inflatable seat may be used with any construction disclosed herein.

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Claims:

1. 1. I claim the invention as disclosed herein.

ABSTRACT OF THE DISCLOSURE

[00138] A manually transportable, electric motor driven highly maneuverable personal watercraft is described. It may comprise a series of inflatable tubular fabric chambers and may optionally incorporate rigid, relatively thin fiberglass or other suitable plastic hull components to reinforce areas that make contact with the waterline, batteries, docks and piers, mooring lines, the rider, or anchors. A seat is optionally provided with multiple chambers, which can optionally be inflated to allow shorter riders to be positioned so that they are tall enough and forward enough to fully operate the controls of the vessel. The craft may also comprise a central area for placement of a battery or batteries, a pump means for inflating and/or deflating the craft, a space for stowing the deflated components of the craft, a place to affix optional rigid or inflatable wheels which help to transport the device when on shore and/or a place to mount the motor and the steering mechanism. The electric motor of this craft drives a propeller or impeller that is housed in a safety cage that prevents accidental contact between swimmers or rocks or the lake bottom and the propeller or impeller. This safety cage may also incorporate one or more tubular sections with one or more motors per tubular section to improve the performance of the vessel while maintaining safety. The thrust and steering system are preferably centrally located and may optionally incorporate means to trim the craft by controlling the direction of the water flow to and or from the propeller or impeller by means of a pivotally mounted horizontal member or members. Steering is accomplished either by turning the electric motor and the propeller or impeller attached thereto or by pivotally mounting a series of vertical members at the outlet of the propeller or impeller to control the direction of flow or by a combination of both of these methods which allows a very rapidly responsive steering system which allows steering with lesser turning of the controls. A speed control and a battery level indicator are optionally incorporated on the steering control member. The speed control may be

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achieved either by turning on and off multiple motors or my using pulse width modulation to reduce the voltage delivered to the electric motor or motors or by having multiple windings on the electric motor or by varying the pitch of the propeller or impeller. Single hull, catamaran and trimaran designs are disclosed with the ability to accommodate 2 or more riders on the catamaran or trimaran. An anchor can optionally be deployed from the central area and is electrically or manually raised and lowered. The craft may optionally incorporate one or more water cannons to allow riders to play various games. Optionally, a live well for keeping caught fish and several fishing pole holders may optionally be incorporated. An optional lighting system is incorporated using super bright LEDs to provide excellent visibility and power conservation. The personal watercraft may optionally be powered by a Stirling engine, steam engine or internal combustion engine driven which would occupy the space allocated for the battery and the electric motor.

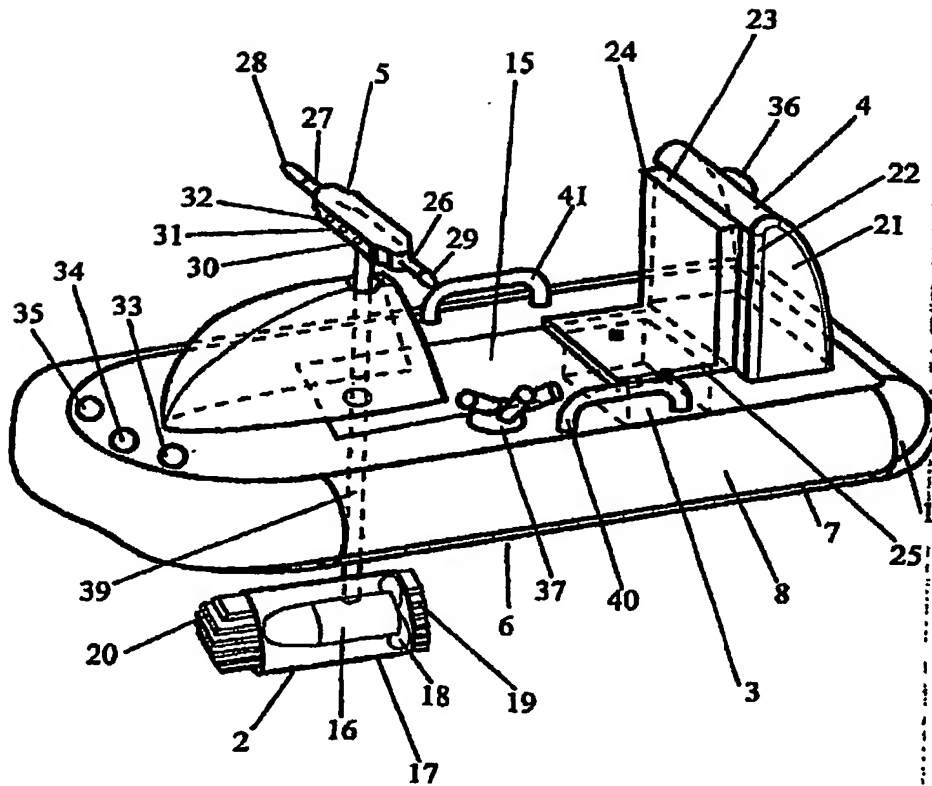


Figure 1a

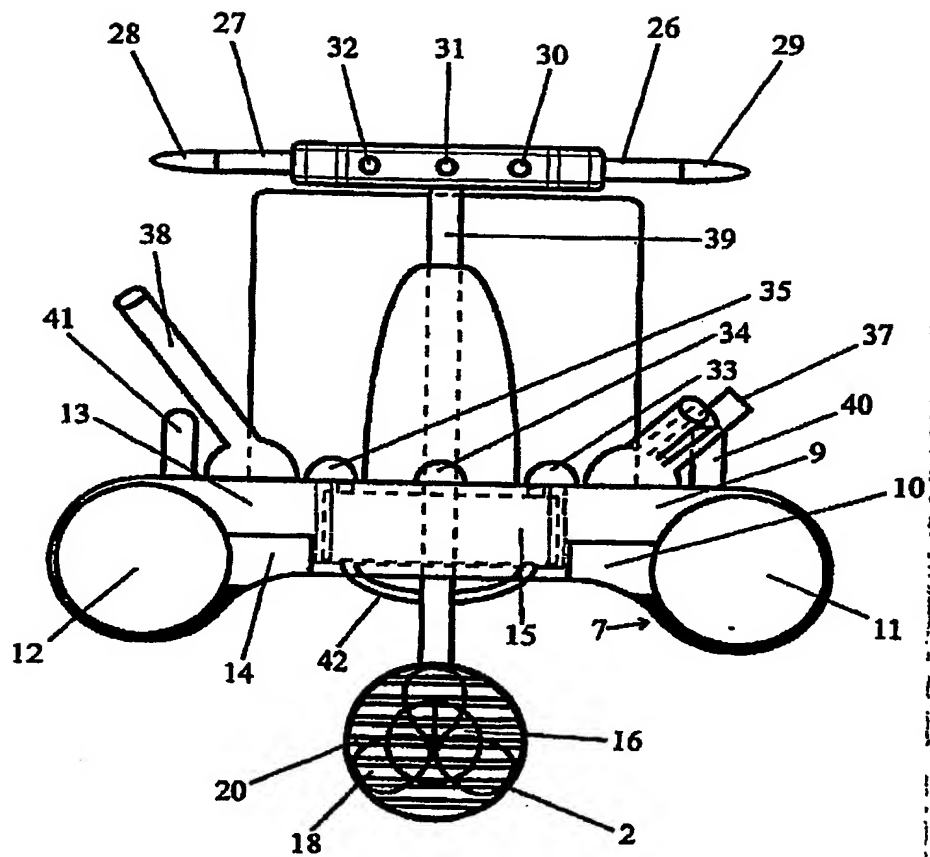


Figure 1b

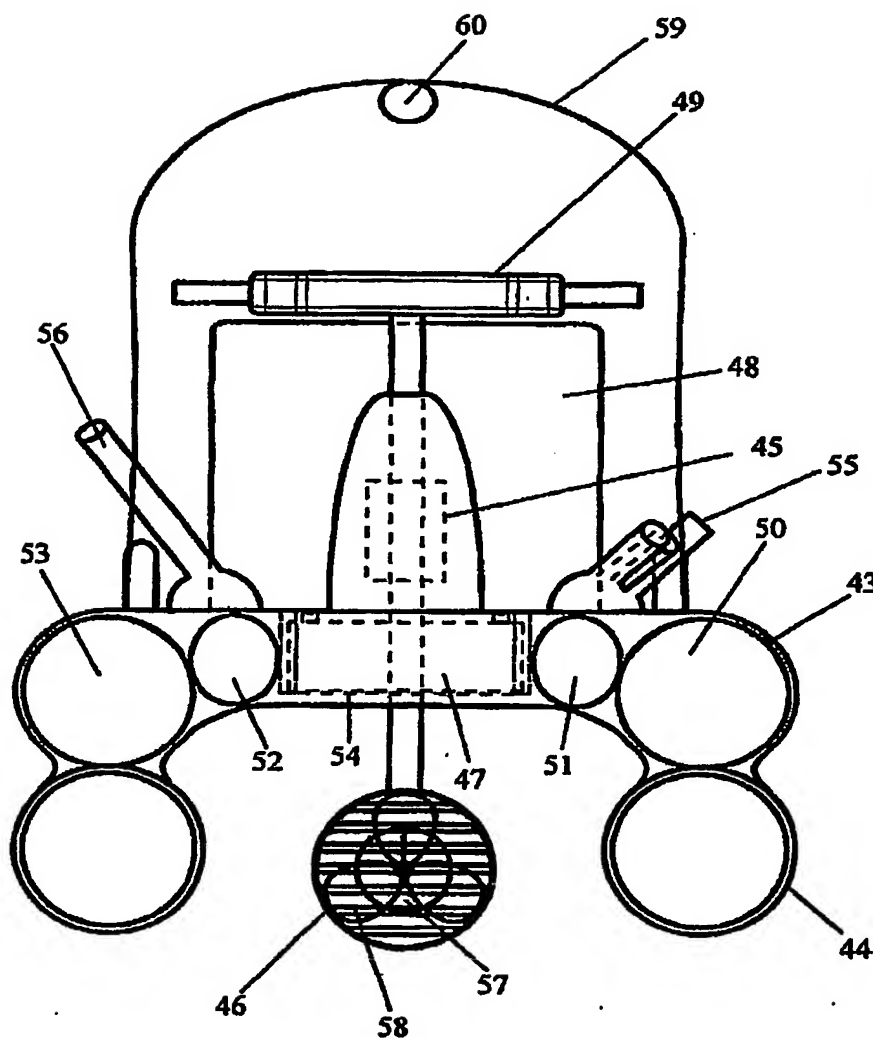


Figure 2a

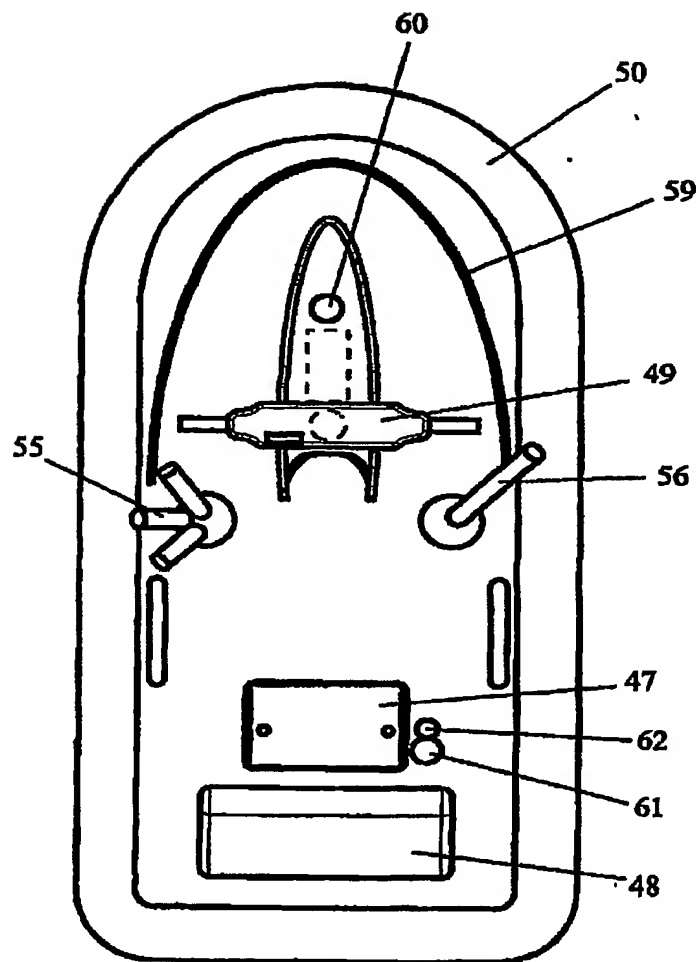


Figure 2c

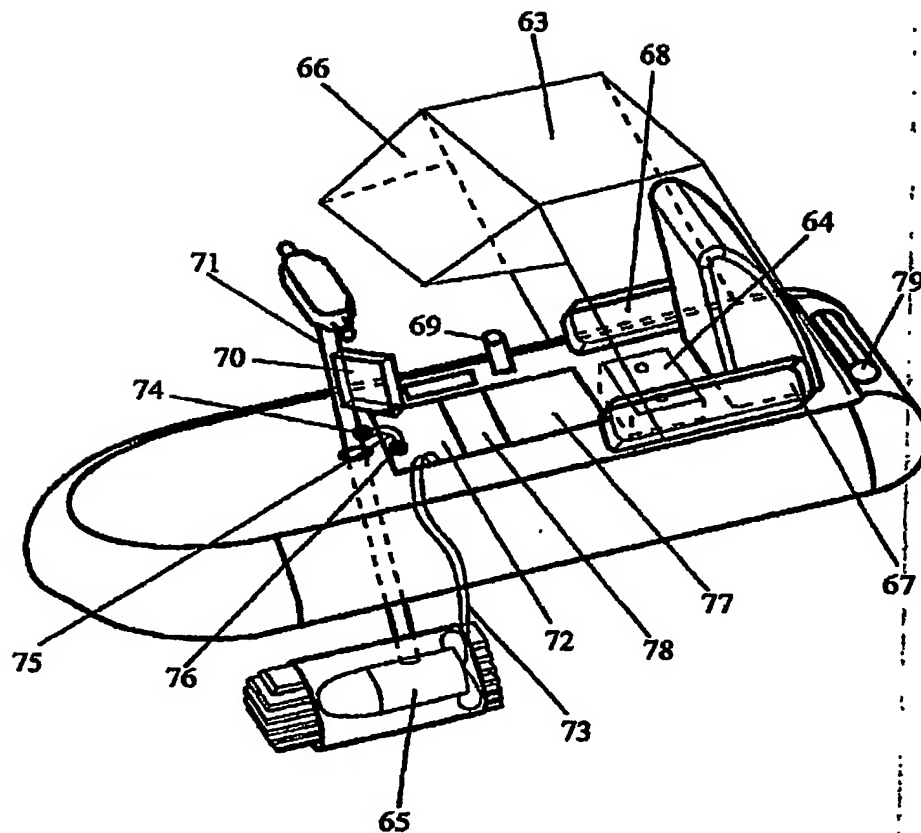


Figure 3

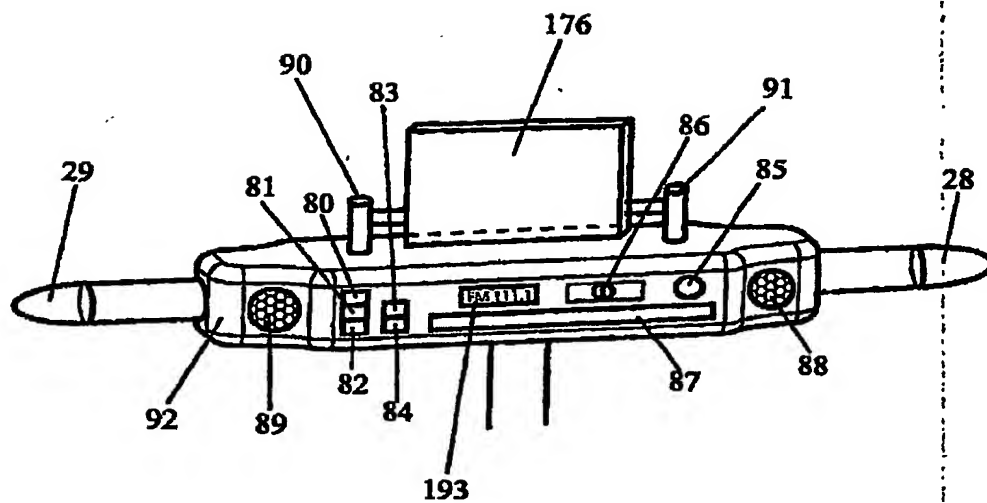


Figure 4

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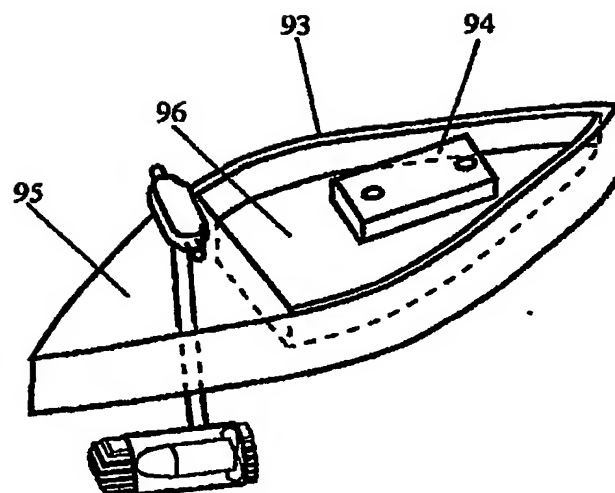


Figure 5a

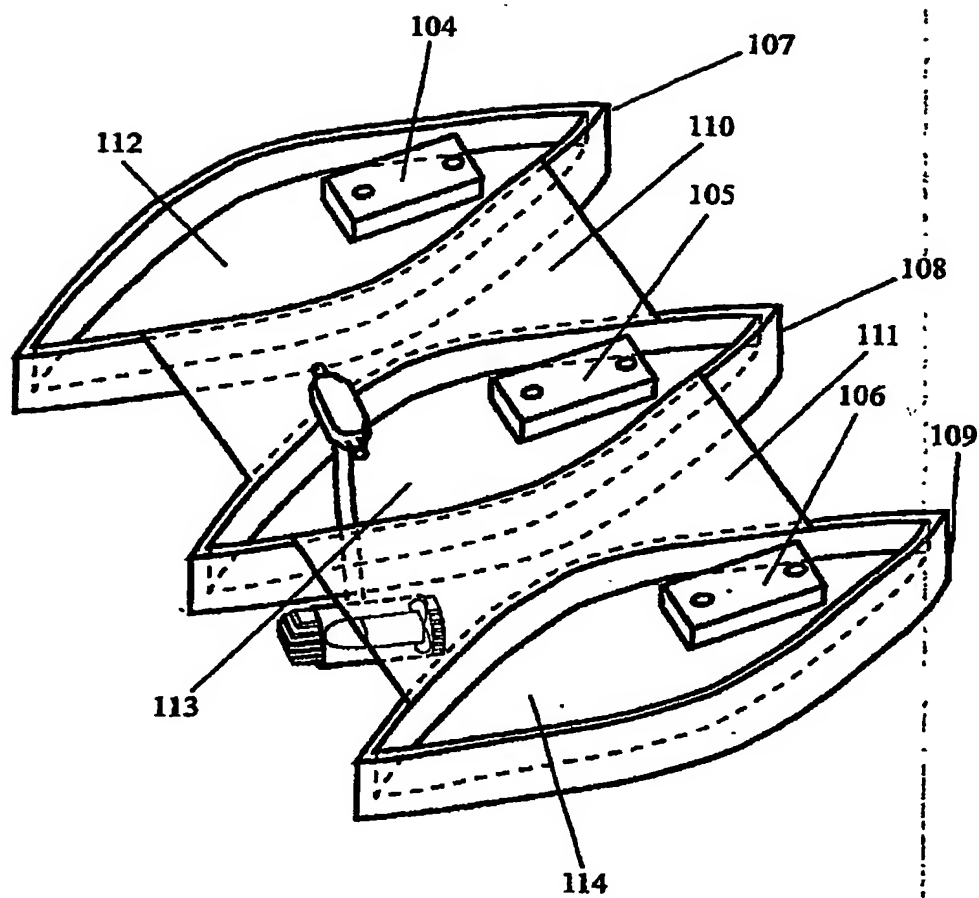


Figure 5c

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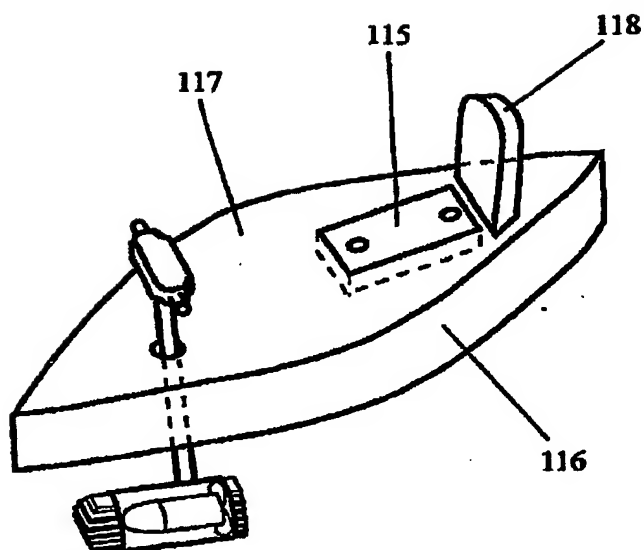


Figure 6a

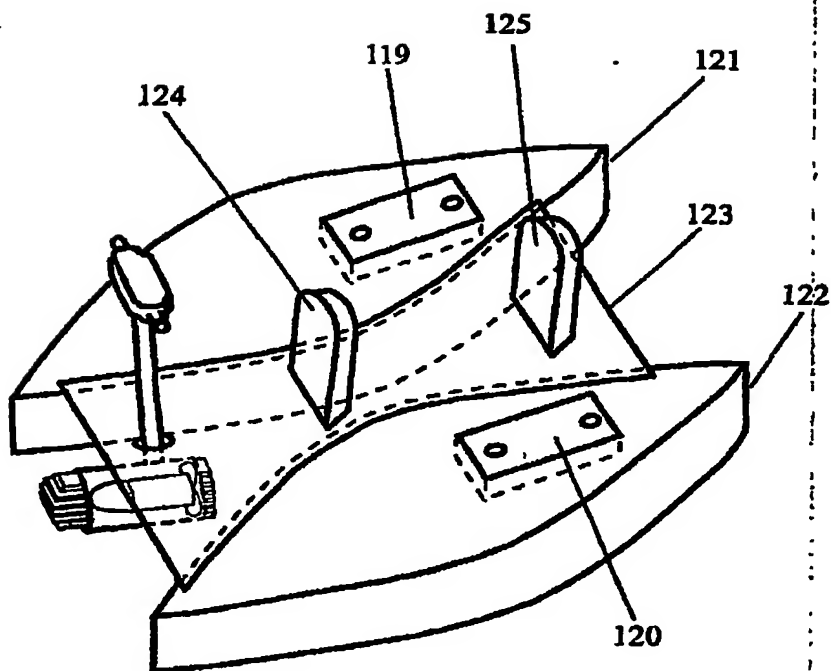


Figure 6b

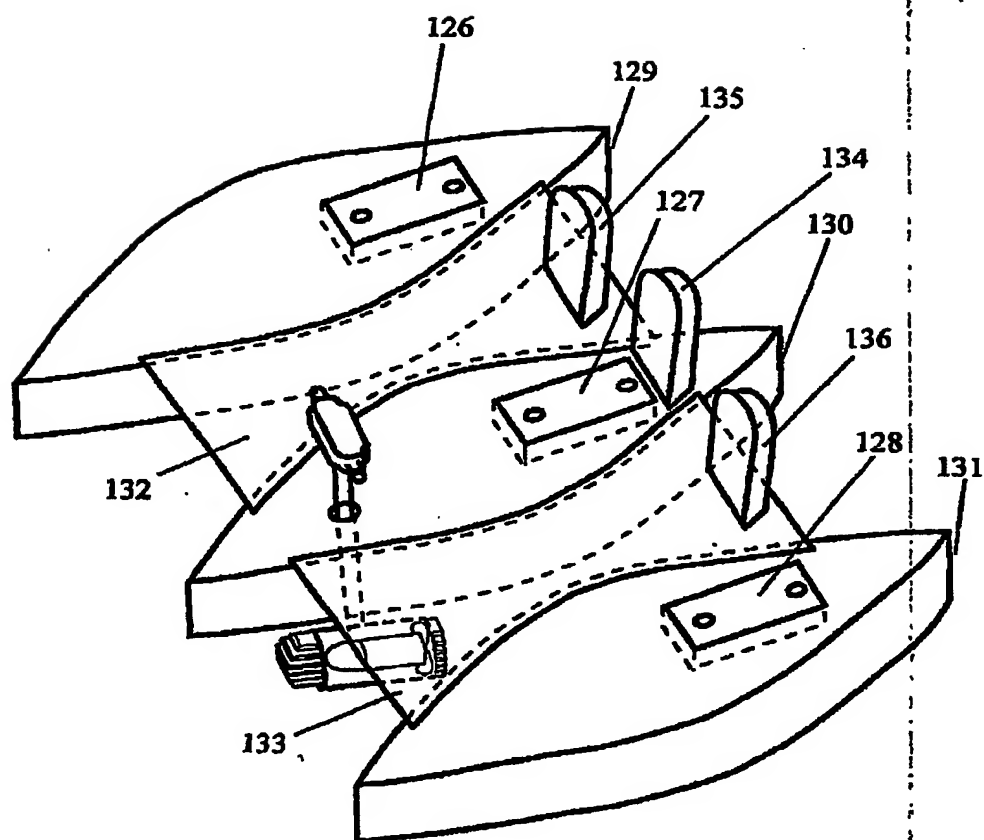


Figure 6c

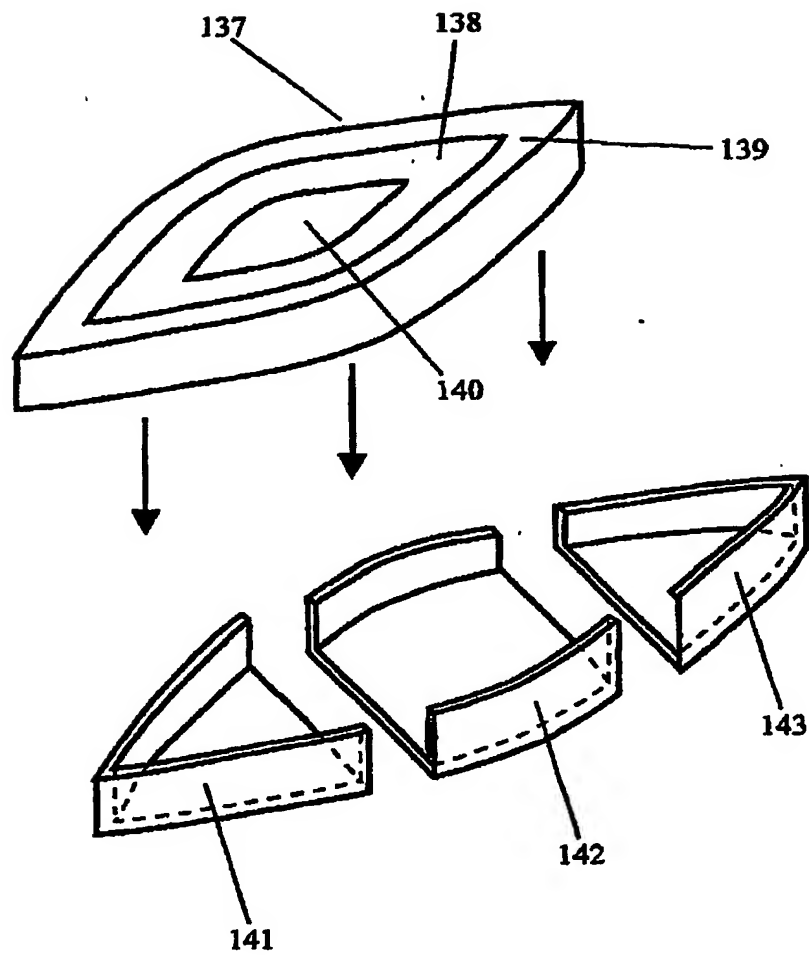


Figure 7

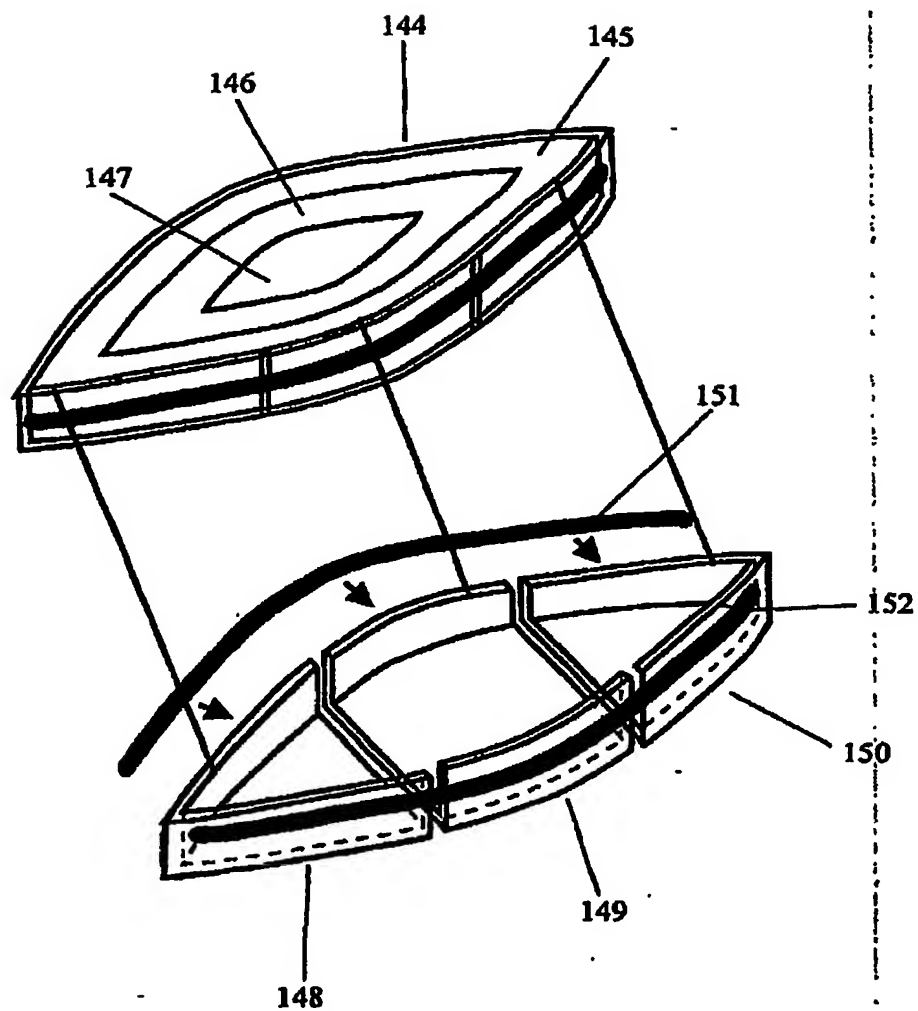


Figure 8

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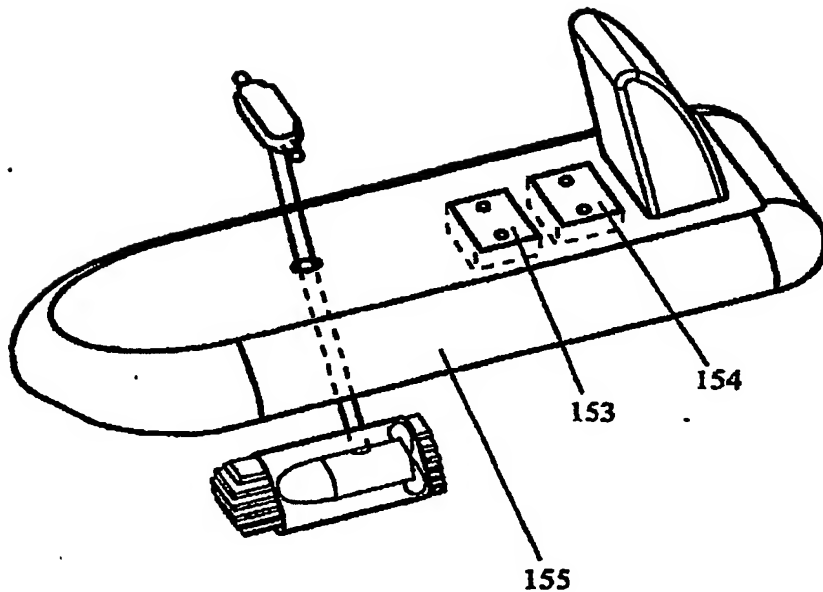


Figure 9

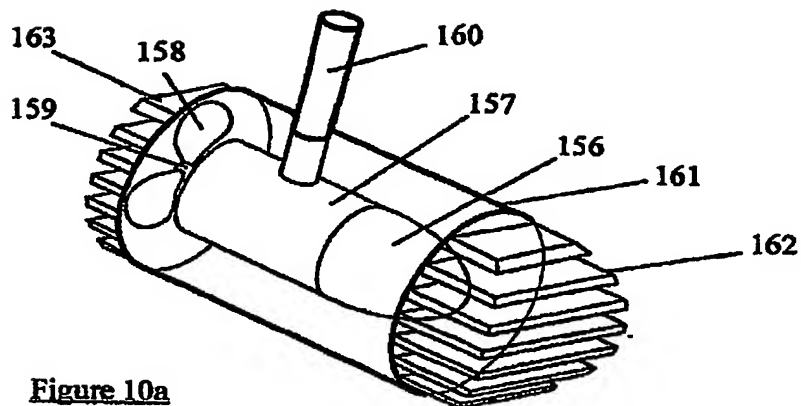


Figure 10a

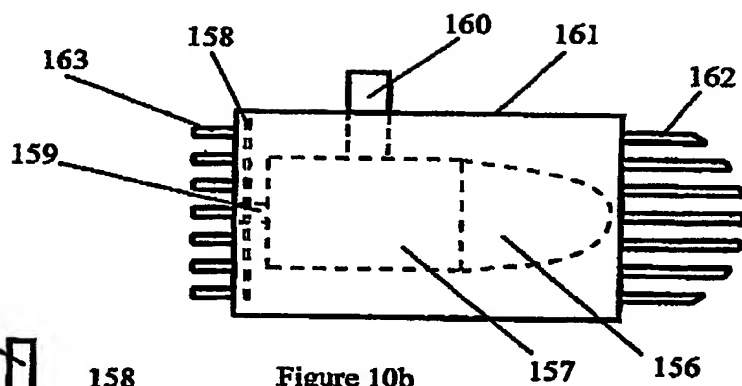


Figure 10b

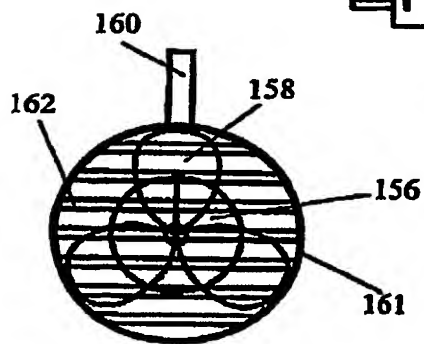


Figure 10c

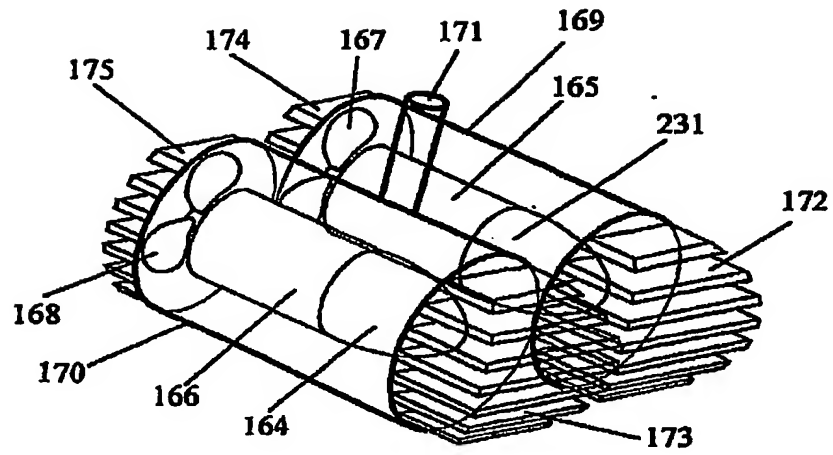


Figure 11a

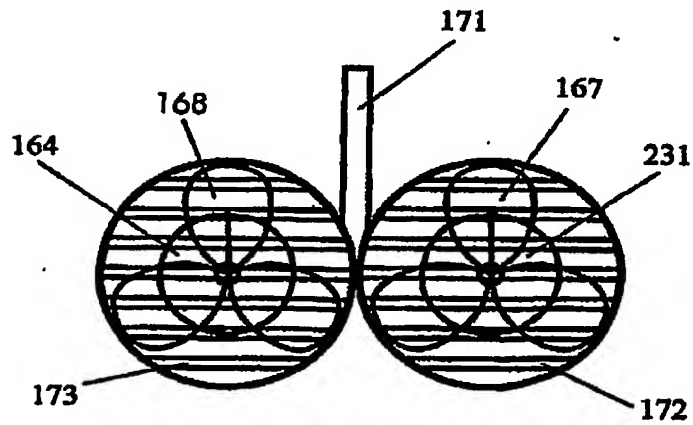


Figure 11b

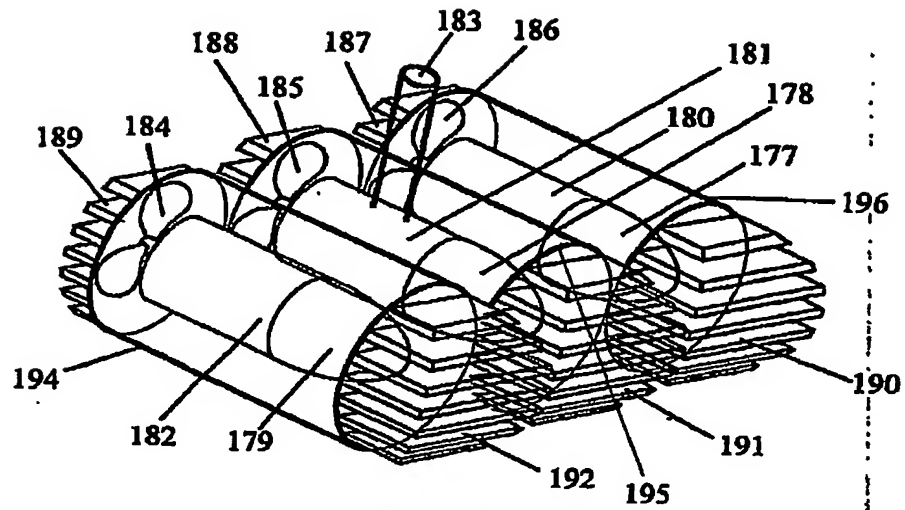


Figure 12a

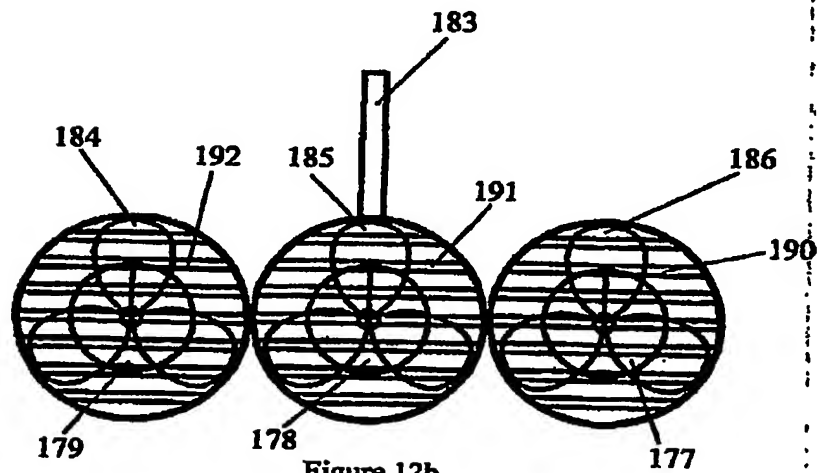
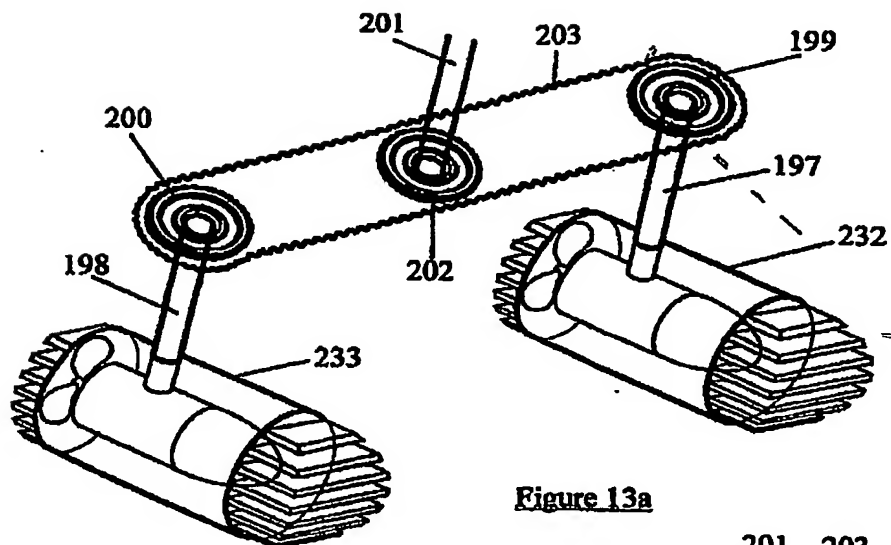
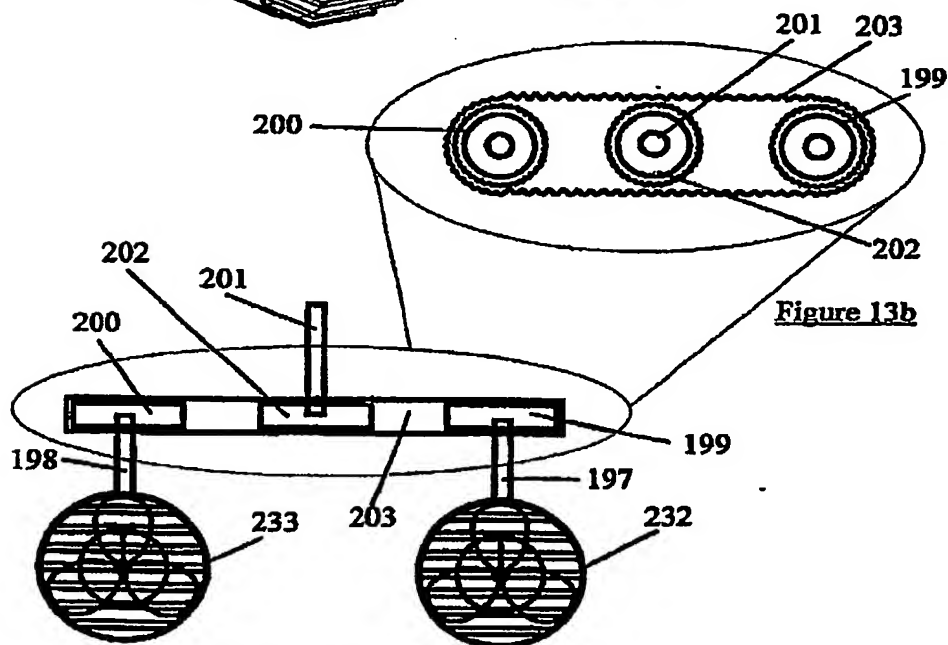
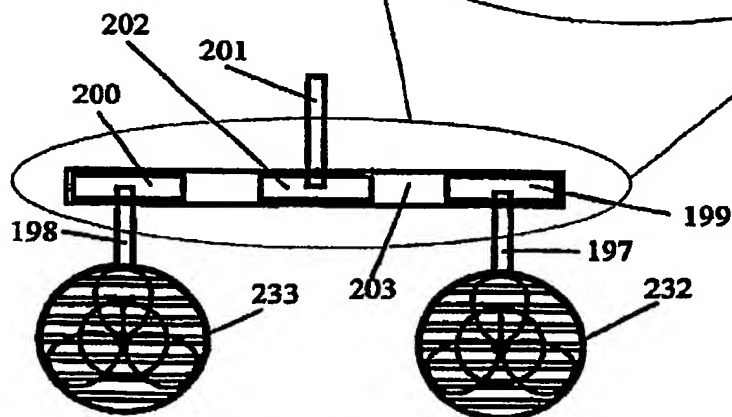


Figure 12b

Figure 13aFigure 13bFigure 13c

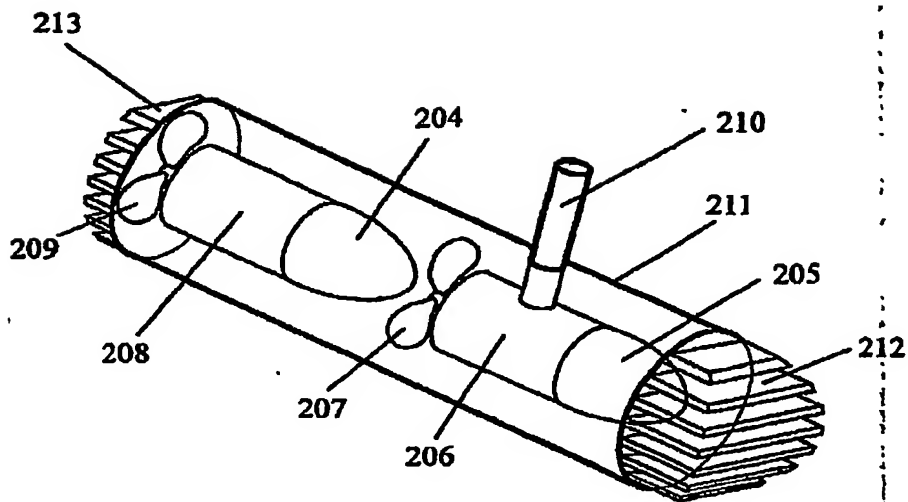


Figure 14a

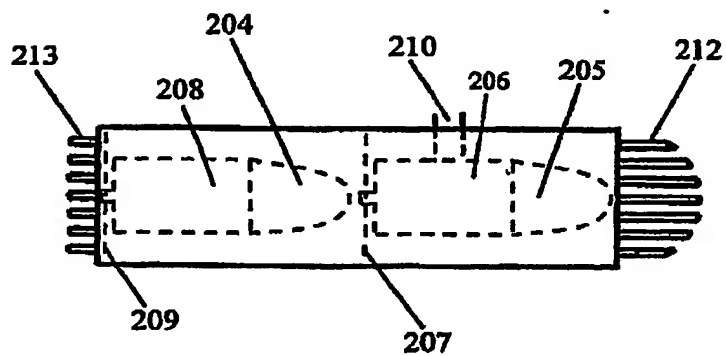


Figure 14b

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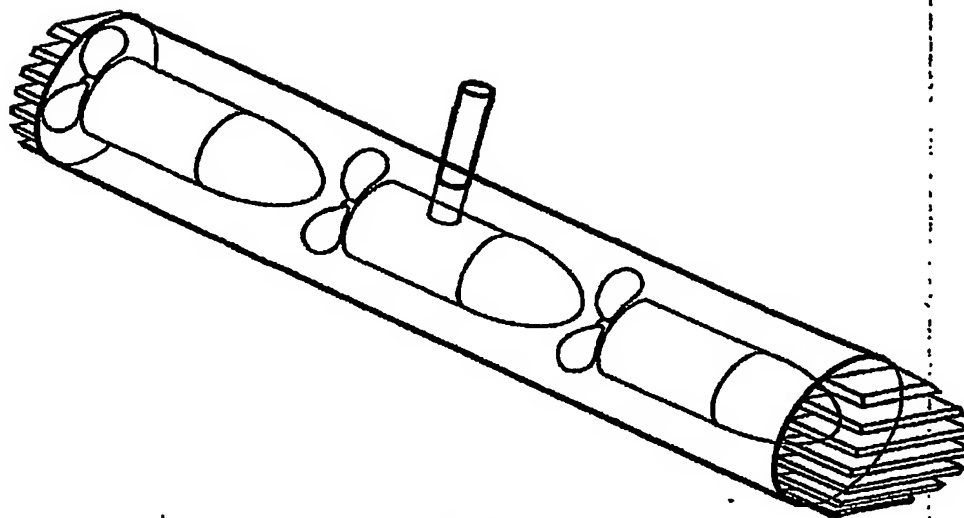


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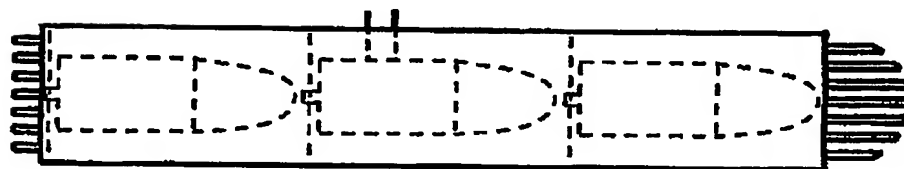


Figure 15b

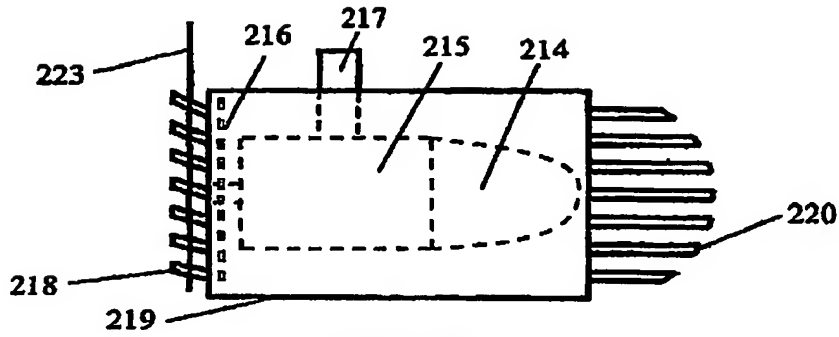


Figure 16a

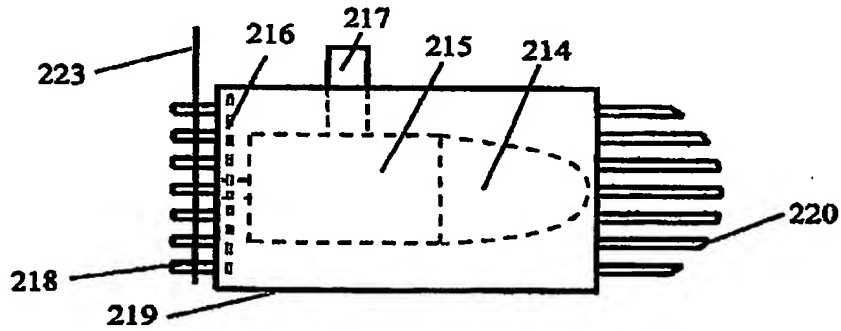


Figure 16b

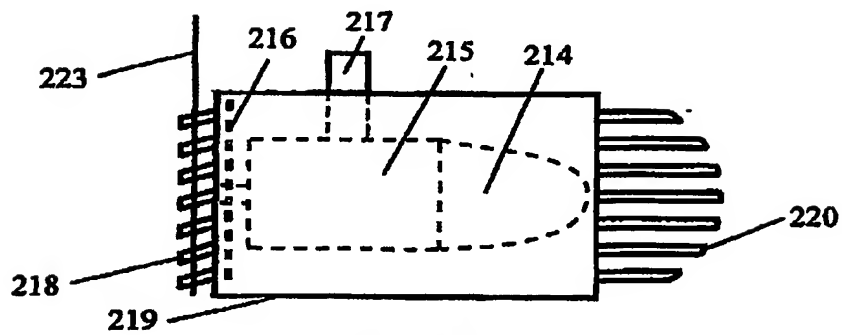
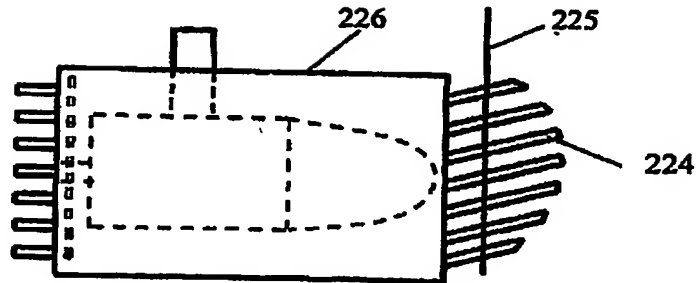
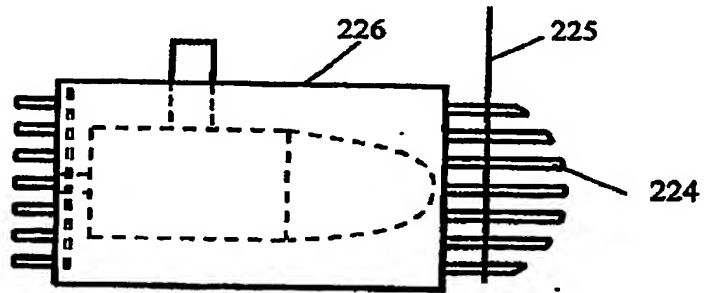
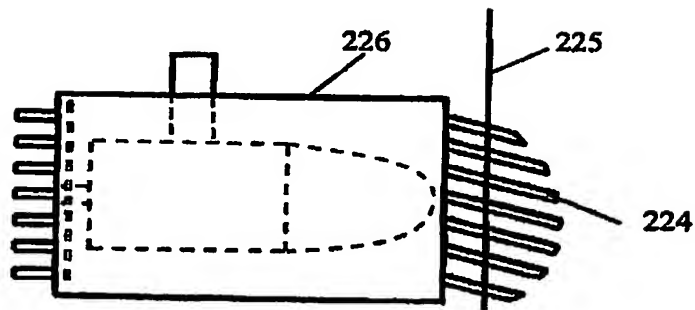
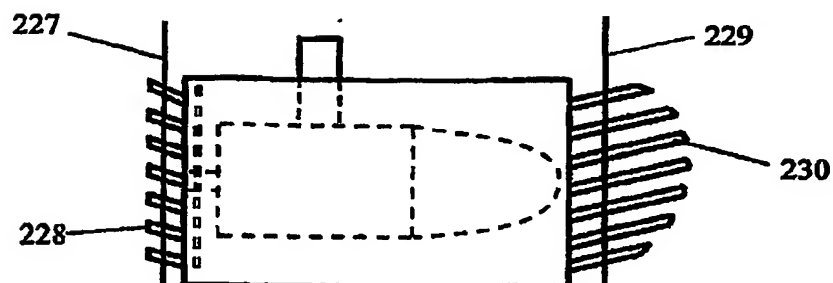
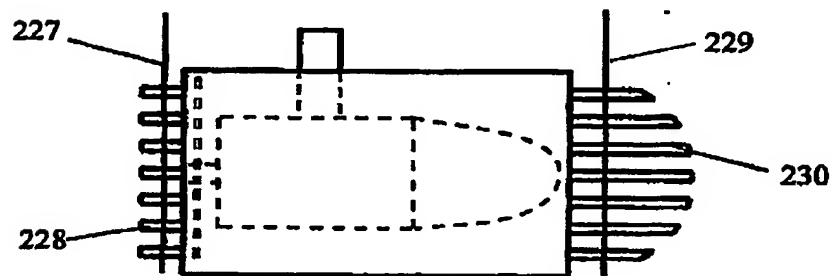
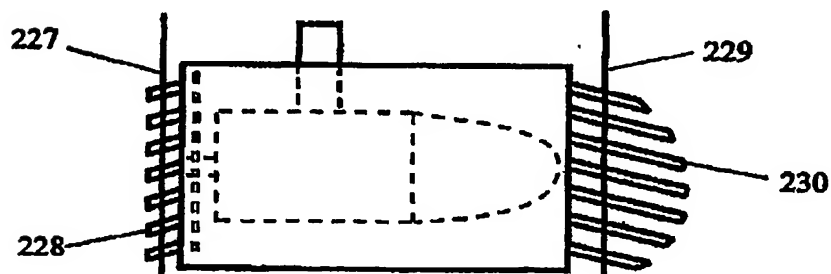


Figure 16c

Figure 17aFigure 17bFigure 17c

Figure 18aFigure 18bFigure 18c

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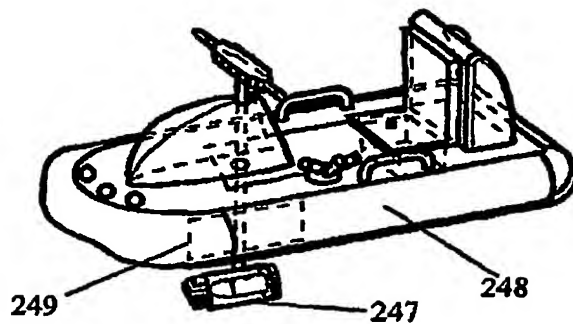


Figure 20a

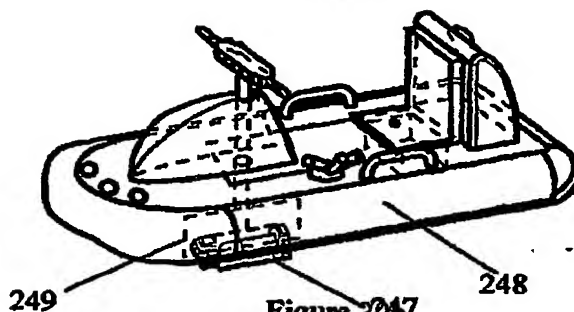


Figure 20b

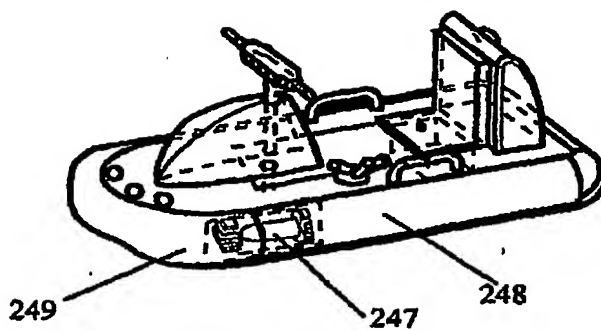
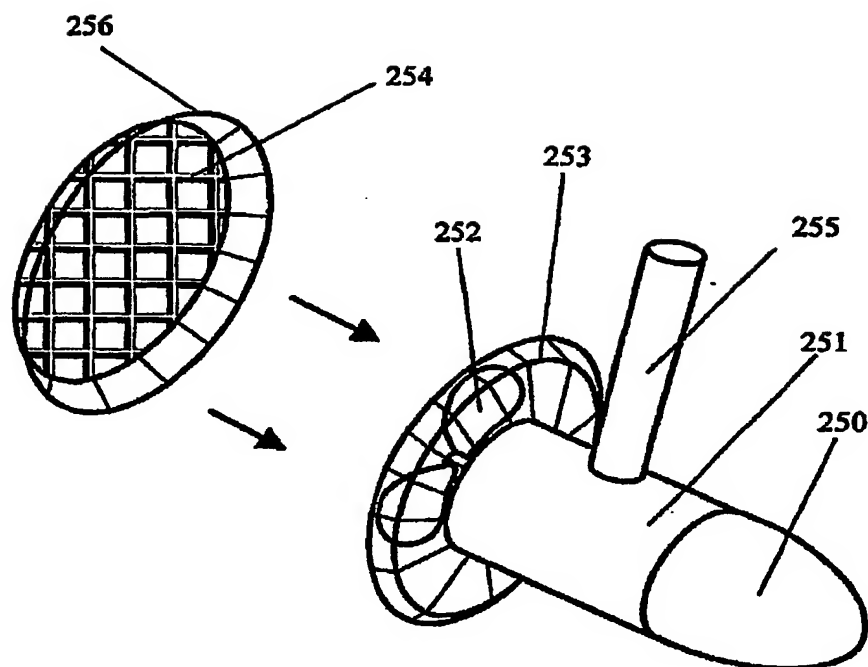


Figure 20c

**Figure 21**

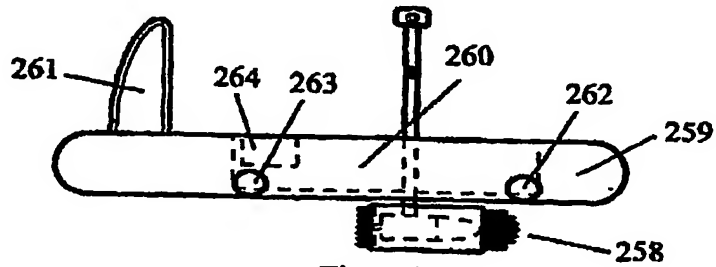


Figure 22a

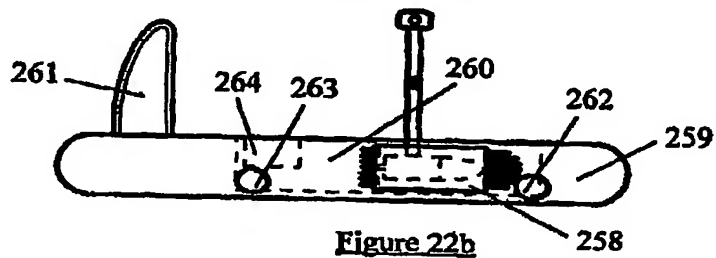


Figure 22b

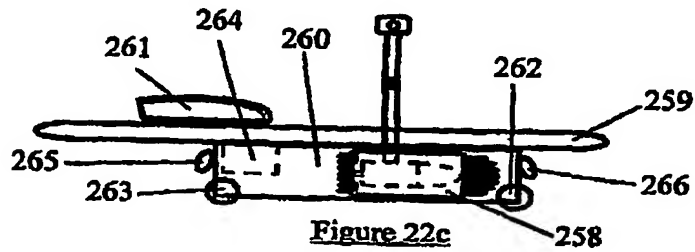


Figure 22c

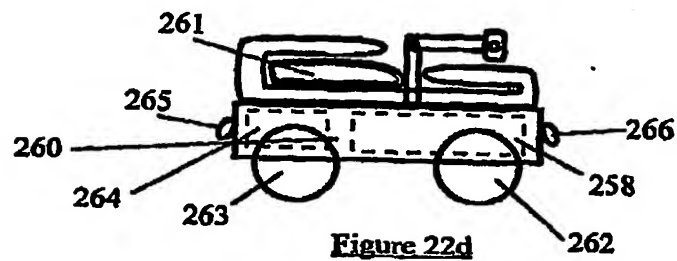


Figure 22d

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